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Biological notes on *Rhysipolis taiwanicus* Belokobylskij (Hymenoptera, Braconidae, Rhysipolinae)

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Abstract

Data on the cocoons and possibly host of *Rhysipolis taiwanicus* Belokobylskij, 1988 (Braconidae, Rhysipolinae) are presented for the first time. Their peculiar cocoons found on the upper surface of a leaf of *Rhaphiolepis indica* (L.) Lindl. are described and illustrated. The species is new for Hong Kong and the second record after its description from Taiwan.

Keywords

Cocoons, Hong Kong, hosts, Indian hawthorn - *Rhaphiolepis indica*, koinobiont ectoparasitoid, new record

Introduction

On 19 April 2022 the junior author discovered six enigmatic cocoons (Figs 1–6) on the upper surface of a leaf of Indian hawthorn (*Rhaphiolepis indica* (L.) Lindl., an evergreen shrub in the family Rosaceae. The leaf was one of a few Indian hawthorn

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leaves collected four days earlier on Hong Kong Island for intended subsequent rearing of an immature stick insect (*Phraortes stomphax* (Westwood, 1859)) that fed on the shrub. Synchronized hatching of six tiny wasps (of ca. 3.2 mm body length; Fig. 12) was observed 9 days later on 28 April 2022 (Figs 7–11). The wasps (Figs 12–15) were identified by the senior author as *Rhysipolis taiwanicus* Belokobylskij, 1988 (Braconidae, Rhysipolinae). Rhysipolinae is a small subfamily of koinobiont ectoparasitoids of lepidopteran larvae (Shaw 1983). According to the most recent phylogenomic research the group is the basal lineage of the rogadinoid subcomplex and the Leuriniinae should be included (Jasso-Martínez et al. 2022a, 2022b). From the East Palaearctic and northern Oriental regions are 13 species of *Rhysipolis* Foerster known, which can be identified with the key by Zhang et al. (2016).

Materials and methods

About five leaves were collected of Indian hawthorn (*Rhaphiolepis indica* (L.) Lindl.) growing along Mount Parker Road midway between Hong Kong Country Trail and Quarry Pass Pavilion inside the Tai Tam (Quarry Bay Extension) Country Park on 15 April 2022. The GPS coordinates are 22°16'10.6"N (22.269599) and 114°12'41.8"E (114.211612). The six cocoons all on one leave were kept at ambient temperature varying between 23.7 to 25 °C and the wasps emerged on 28 April 2022. Two specimens were sent to the senior author, prepared and deposited in the Naturalis Biodiversity Center (Leiden, Netherlands) and the remaining four specimens are deposited in the Shatin Plant Quarantine Station, (Hong Kong, China).

For the morphological terminology used in this paper see van Achterberg (1988, 1993). The cocoons were examined and measured by the junior author with a Leica M205C stereomicroscope. Photos were taken using a Leica DFC450 digital camera mounted to a Leica M205C stereomicroscope. Each photo was produced by taking 10–50 digital images at different focal planes and combining them into a sharp composite image using the Leica Applicadtion Suite multifocus software v.4.13. Photographic images of adult wasp were edited using Adobe Photoshop to hide the insect pinning.

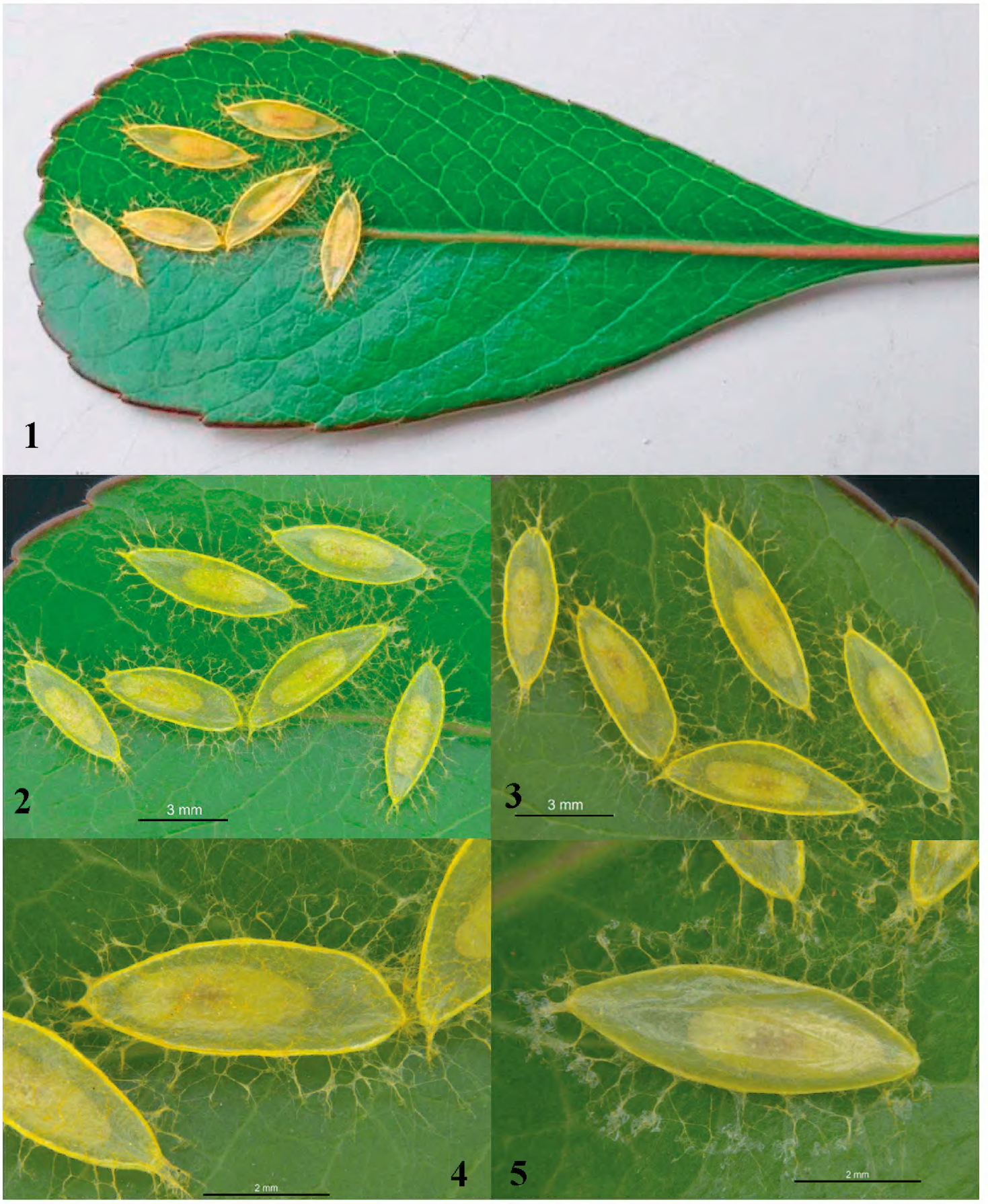
Rhysipolis taiwanicus Belokobylskij, 1988

Figs 1–15

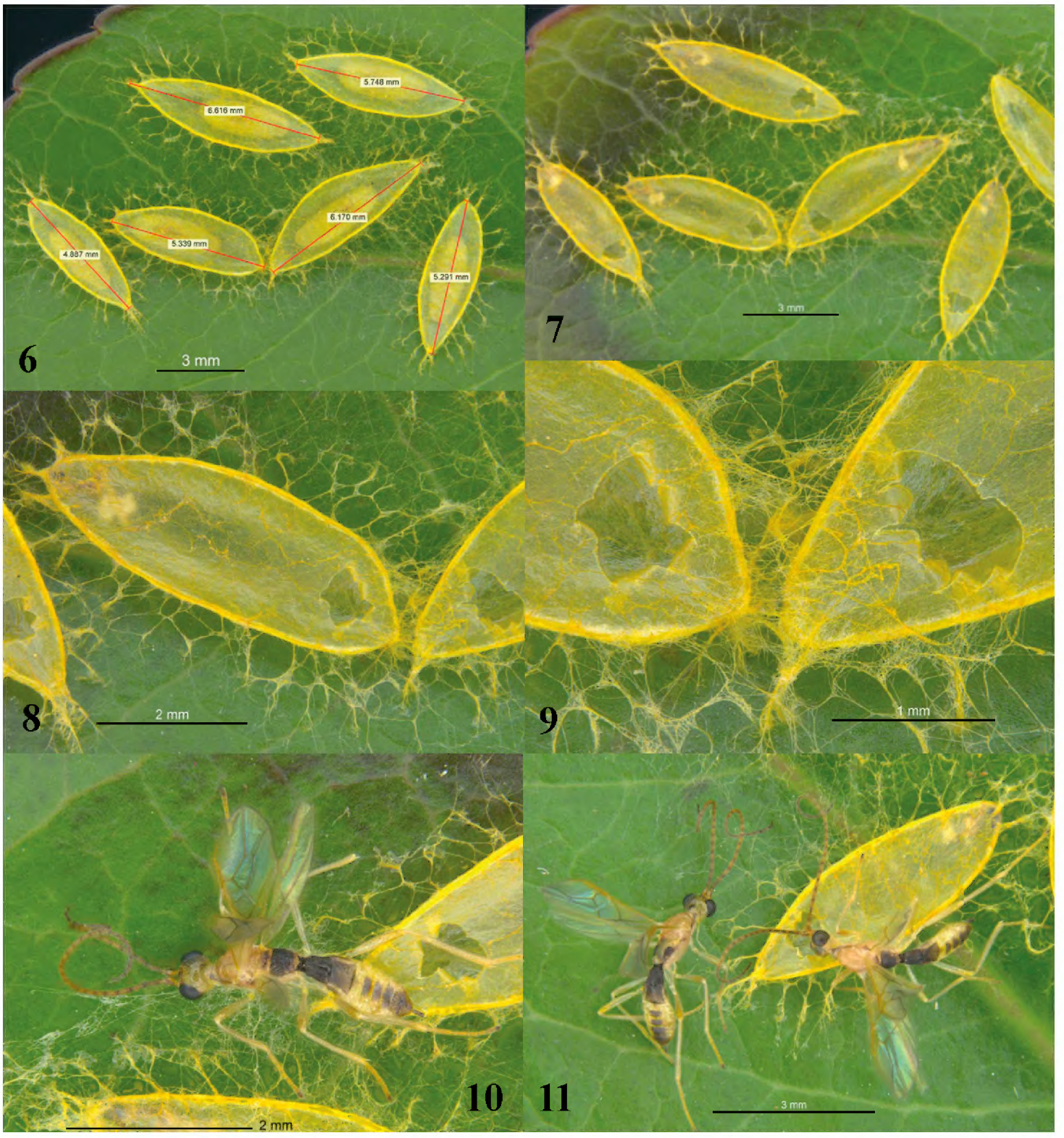
Notes. *Rhysipolis taiwanicus* Belokobylskij is a rarely collected species known from Taiwan and Vietnam (Belokobylskij 1988; Long and Belokobylskij 2004). It can be easily differentiated from similar species by the small stemmaticum and ocelli, the glabrous middle lobe of the mesoscutum, the strongly receding temples behind the eyes and the subglobular head (Zhang et al. 2016). The stemmaticum is situ-

ated comparatively close to the antennal sockets (Fig. 15). The body length of the imagines is 3.2–4.0 mm (Belokobylskij 1988; this paper) and are slender with long straight antennae when alive but the antennae are curled up after death (Figs 10–12) as in most Rhysipolinae.

Biology. The bright yellow cocoons were on the upper side of the leaf and appeared to naked eyes as little fried eggs (Fig. 1). At closer look, they resembled elongated



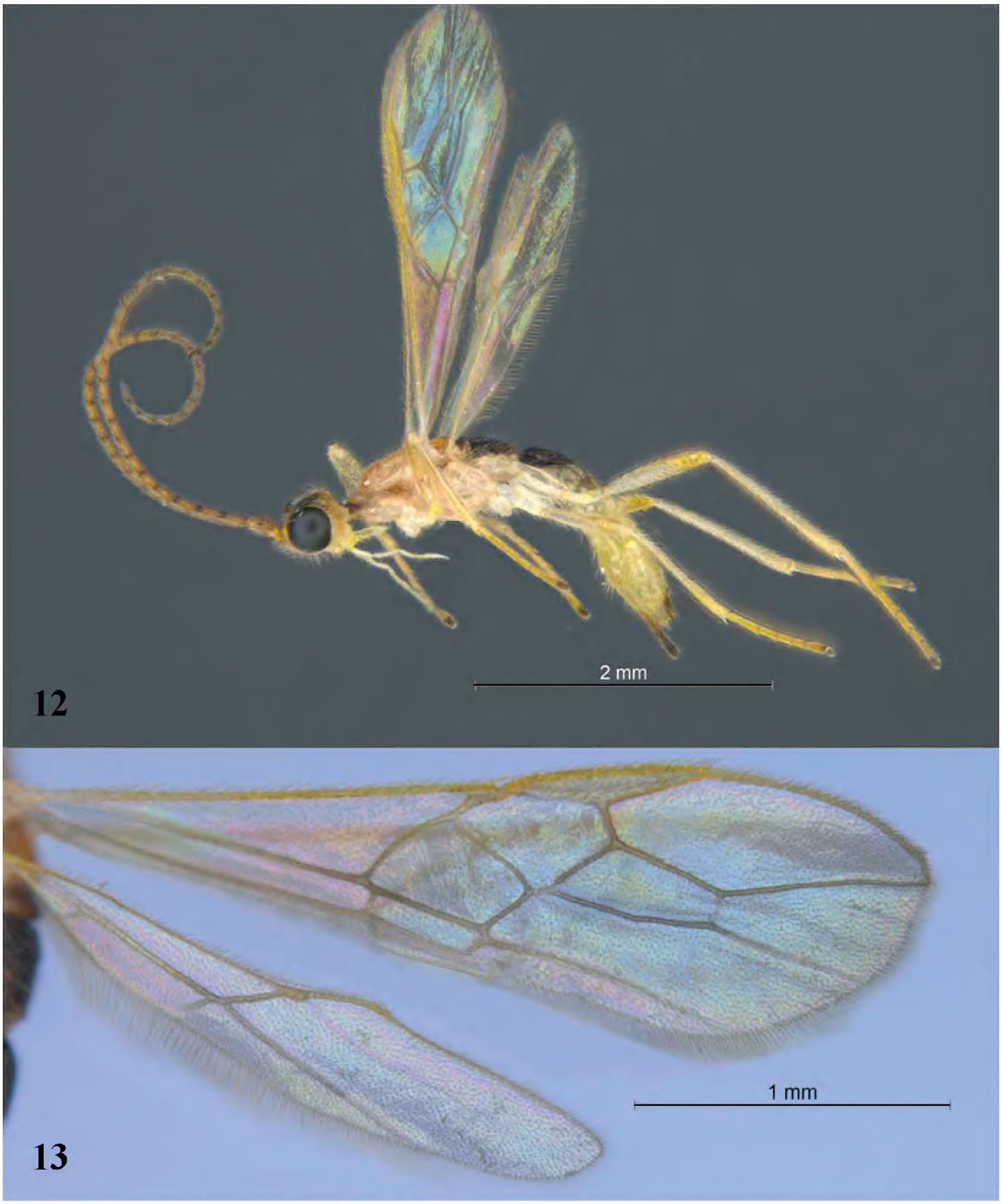
Figures 1–5. Cocoons of *Rhysipolis taiwanicus* Belokobylskij on *Rhaphiolepis indica* (L.) Lindl.



Figures 6–11. Cocoons of *Rhysipolis taiwanicus* Belokobylskij on *Rhaphiolepis indica* (L.) Lindl. **6** sizes of cocoons **7–9** cocoons after hatching **10–11** hatched wasps near cocoons.

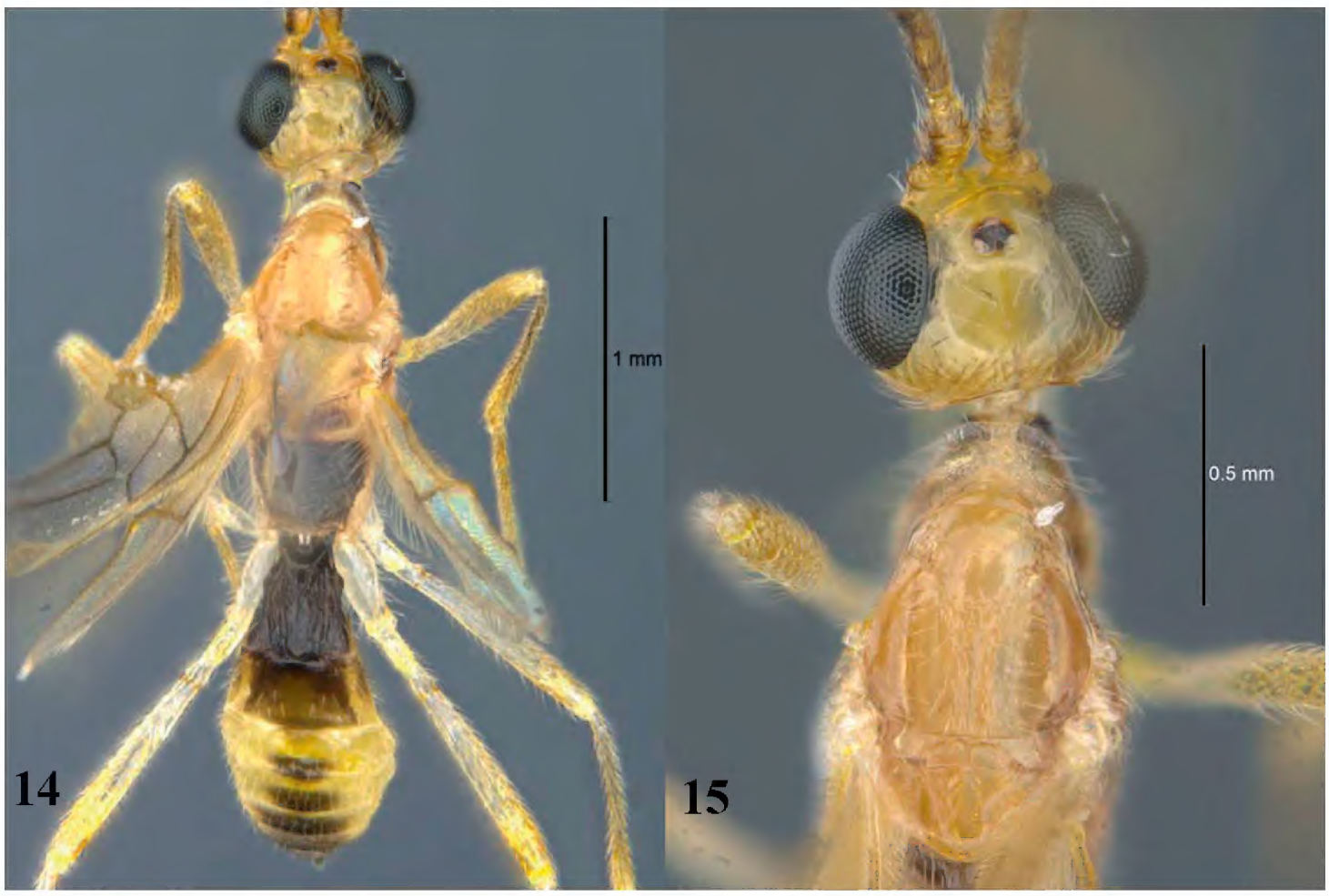
trampolines fixed to a leaf by silken threads (Figs 2–5). All cocoons were found at the distal part of the leaf (Fig. 1) and the average size was 5.67 ±0.63 mm long (Fig. 6). The wasps inside the cocoons were showing obvious movement (Figs 3–5) before hatching simultaneously 13 days after the collecting of the leaves.

Checking for small lepidopterans occurring on *Rhaphiolepis indica* seems to be the best possible tactic to discover the unknown host of *Rhysipolis taiwanicus*. *Rhaphiolepis indica* is one of the most common shrubs on hillsides in Hong Kong. So far seven species of caterpillars are known to feed on this plant (Table 1). Given the recorded



Figures 12–13. *Rhysipolis taiwanicus* Belokobylskij. **12** habitus, lateral **13** wings.

hosts of *Rhysipolis* species are mainly leaf-mining microlepidopterans belonging to the Gracillariidae and to a much lower degree to Gelechiidae, Psychidae and Pyralidae (Yu et al. 2016; Zhang et al. 2016), it may worth to have a close look at *Dichomeris ochthophora* Meyrick, 1936 (Li et al. 2010) in due course to investigate if it could be the unknown host of *Rhysipolis taiwanicus* Belokobylskij. A second choice would be *Chalioides kondonis* Kondo, 1922.



Figures 14–15. *Rhysipolis taiwanicus* Belokobylskij. **14** habitus, dorsal **15** detail of head and mesosoma, dorsal.

Table 1. Lepidoptera associated with *Rhaphiolepis indica* (L.) Lindl.

Species	Family: Subfamily	Reference
Caeneressa diaphana (Kollar, 1848)	Erebidae: Arctiinae	Personal record of junior author
Chalioides kondonis Kondo, 1922	Psychidae: Psychinae	Personal record of junior author
Delias pasithoe pasithoe (L., 1767)	Pieridae: Pierinae	Personal record of junior author
Dichomeris ochthophora Meyrick, 1936	Gelechiidae: Dichomeridinae	Li et al. 2010. Host plant was cited as *Rhaphiolepis umbellata* (Thunb.) Makino which is a synonym of *Rhaphiolepis indica* (L.) Lindl.
Nygmia plana (Walker, 1855)	Erebidae: Lymantriinae	Personal record of junior author
Remelana jangala mudra (Fruhstorfer, 1907)	Lycaenidae: Theclinae	Personal record of junior author
Zeuzera coffeae Nietner, 1861	Cossidae: Zeuzerinae	Pun and Batalha 1997

Discussion

The minute ocelli are an indication that *R. taiwanicus* is a day-active species and may be found searching for the host caterpillars during day time. According to the known host relationships of *Rhysipolis* species it is considered likely that *Rhysipolis taiwanicus* emerged from *Dichomeris ochthophora* Meyrick or *Chalioides kondonis* Kondo. The reason of the peculiar attachment of the cocoons is unclear, but it might be an adaptation to drain off water.

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